CHAPTER 8

DISCUSSION QUESTIONS

Q8-1. Joint products represent two or more products separated in the course of the same processing operation, with each product having such relative value that no one product can be designated as a major product.

A by-product is relatively minor in terms of total value and is derived incidentally from the production or manufacture of one or more major products.

Q8-2. Revenue from the sale of by-products may be listed as other income, additional sales revenue, a deduction from the cost of goods sold of the main product, or as a deduction from the cost of production of the main product.

Q8-3. Yes, when by-product revenue is deducted from the total production cost of the main product, the unit cost of the main product is reduced; consequently, the cost of the ending inventory changes also.

Q8-4. The replacement cost method can be used in such cases. In this method, the by-products that go into making other units are valued at the cost the company would have to pay if it were to go out on the market and purchase such materials.

Q8-5. (a) The treatment described for by-products may be justified when, relative to main value products, the revenue generated by the by-product is insignificant; when no clearly defined basis of identifying by-product costs exist; or when the cost of more refined accounting would be disproportionate to the benefits received.

(b) The treatment described has several shortcomings. All gross profit is ascribed to major products and is incorrect as a measure of total gross profit, since the inventories of by-products that may be unsold at the end of the period will have a zero value. Failure to assign values to by-products may well mean they are not recognized as inventories at all. This, in turn, could lead to their waste, theft, or other mishandling. If by-products are sold irregularly and inventories are allowed to accumulate, both a material understatement of inventories and a distortion of reported net income of successive periods may result.

Q8-6. Yes, some of the initial manufacturing costs, additional manufacturing costs (when by-products are further processed after separation), and perhaps even marketing and administrative expenses may be charged to the by-products.

Q8-7. Methods for allocating the total joint production cost to joint products are:

(a) Allocate the joint cost on the basis of the relative market value of the joint products.

(b) Allocate the joint cost by using an average unit cost obtained by dividing the total joint manufacturing cost by the total number of units produced.

(c) Allocate the joint cost on the basis of weight factors such as size, difficulty of manufacture, or amount of materials used.

(d) Allocate the joint cost on the basis of some unit of measurement such as pounds, tons, or gallons. If the joint products are not measured in the same way, they must be converted to a denominator that is common to all the units produced.

Q8-8. The market value method considers the revenue-producing ability of the joint products by assuming that each should be valued according to its cost absorption ability. Resulting inventory costs are in harmony with revenue producing ability and, if the combined joint products are profitable, the market value method avoids allocating more cost to a product than its revenue; thus achieving a neutral effect. However, this method may be difficult to apply if the market value at the split-off point is not known.

The average unit cost method, while simple to apply when units are measured in like terms, fails to consider the heterogeneous nature of the individual products.

Q8-9. Joint costs must be allocated to joint products when there is inventory to be costed.

Q8-10. Not exactly. A new manufacturer would do well to consult the Internal Revenue Service about the methods to be used, so that an IRS agent can make a decision before the tax return is prepared. In other cases, where an allocation method has been applied consistently from year to year, to apply for a ruling would not be good strategy.

Q8-11. The method used in calculating unit costs produces the same unit cost for all grades of lumber sold. The owner is then led to believe that the same costs in the same ratio are attributable to the low as well as the high grade lumber.

It must also be recognized that because of the inherent nature of the materials and the milling process, it is not possible to eliminate low grade lumber. Thus, the profitability of the operation can be viewed best by considering the aggregate of revenue and costs of both the high and low grades of lumber, coupled with controls to assure that all practical steps are taken to obtain high quality logs and to mill them properly. A higher price for logs may be justified in terms of a greater amount of high grade lumber.

Q8-12. For decision making, joint costs are irrelevant unless they are expected to change as a result of the decision. Usually, only costs beyond the split-off are relevant.

EXERCISES

E8-1 **(1) Net revenue method:**

Gross revenue from sale of by-product		$20,000
Production cost after separation.....		6,000
Net revenue from sale of by-product.....		$14,000

(2) Market value (reversal cost) method:

Final market value		$20,000
Less: Profit ($20,000 × 10%).....	$2,000	
Marketing and administrative expenses ...	1,000	
Production cost after separation.....	6,000	9,000
Joint cost allocated to the by-product		$11,000

E8-2

(1) Calculation of manufacturing cost before separation for by-products.

	By-Product A	By-Product B
Sales	$6,000	$3,500
Manufacturing cost after separation	$1,100	$ 900
Marketing and administrative expenses	750	550
Profit allowance (A, 15%; B, 12%).....	900	420
	$2,750	$1,870
Manufacturing cost before separation	$3,250	$1,630

E8-2 (Concluded)

(2)

LOGAN COMPANY
Income Statement
For Month Ended April 30

	Main Product	By-Product A	By-Product B	Total
Sales	$75,000	$6,000	$3,500	$84,500
Cost of goods sold:				
Before separation (requirement (1))	$32,620	$3,250	$1,630	$37,500
After separation	11,500	1,100	900	13,500
	$44,120	$4,350	$2,530	$51,000
Gross profit	$30,880	$1,650	$970	$33,500
Less marketing and administrative expenses	6,000	750	550	7,300
Profit from operations	$24,880	$ 900	$ 420	$26,200

E8-3

Product	Market Value at Split-Off	Apportionment of Joint Production Cost*
W	$ 80,000	$ 60,000
X	60,000	45,000
Y	40,000	30,000
Z	20,000	15,000
Total	$200,000	$150,000

$$\frac{*\$150,000}{\$200,000} = 75\%$$

E8-4

Z:	Market value per unit		$ 9.00
	Gross profit, consisting of:		
	Operating profit	$2.00	
	Marketing and administrative expenses	1.00	3.00
			$ 6.00
	Further processing cost		2.00
	Value per unit of by-product at split-off		$ 4.00
	Value of by-product to be credited to joint cost (2,000 units × $4)		$8,000

8-4 (Concluded)

X and Y:

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Apportionment of Joint Production Cost*
X	$20	8,000	$160,000	$ 40,000	$120,000	$ 80,000
Y	25	10,000	250,000	70,000	180,000	120,000
			$410,000	$110,000	$300,000	$200,000**

* Ratio to allocate cost prior to separation $\frac{\$200,000}{\$300,000} = \frac{2}{3}$

**$208,000 cumulative joint cost less $8,000 value of credit for by-product.

E8-5

(1)

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Apportionment of Joint Production Cost
E	$4.30	30,000	$129,000	$30,000	$ 99,000	$ 66,000*
S	6.60	15,000	99,000	24,000	75,000	50,000
C	6.00	13,000	78,000	27,000	51,000	34,000
Total.....			$306,000	$81,000	$225,000	$150,000

* $150,000 ÷ $225,000 = 2/3; $99,000 × 2/3 = $66,000

(2)

Differential revenue (15,000 × ($6.60 – $5.50))..	$16,500
Differential cost	24,000
Net effect of separable processing.....	$ (7,500)

Conclusion: Based on the information given, S should be sold at the split-off point.

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E8-6 (1)

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value*	Apportionment of Joint Production Cost**	Total Production Cost	Total Production Cost per Unit	Ending Inventory Units	Cost Assigned to Ending Inventory
A	$100	1,000	$100,000	$ 25,000	$ 75,000	$ 54,000	$ 79,000	$79.00	200	$15,800
B	80	3,000	240,000	60,000	180,000	129,600	189,600	63.20	500	31,600
C	50	5,000	250.000	105,000	145,000	104,400	209,400	41.88	700	29.316
Total			$590,000	$190,000	$400,000	$288,000	$478,000			$76,716

*At the split-off point

**Percentage to allocate joint production cost: $288,000 ÷ $400,000 = 72%

E8-6 (Concluded)

(2)

	Product A	Product B	Product C
Differential revenue per unit	$40	$15	$25
Differential cost per unit:			
$25,000 ÷ 1,000	25		
$60,000 ÷ 3,000		20	
$105,000 ÷ 5,000			21
	$15	$ (5)	$ 4

Conclusion: Only product B's differential cost exceeds its differential revenue. Therefore, only product B should be sold at the split-off point.

(3) Yes, because the short-run impact of further processing of B is then:

	B
Differential revenue	$15
Differential cost: ($60,000 - $18,000) ÷ 3,000	14
Benefit to further processing	$ 1

(In the long-run decision to invest in the capacity [facilities] needed to further process B, the fixed cost should, of course, be considered.)

(4) No. From part (3), the benefit of further processing is $1 for each of the 3,000 units of B, or $3,000. But that must be compared with the benefit of the alternative use of facilities, $6,000 – $1,000 = $5,000 of short-run benefit. So it is better in the short run to sell B at split-off and devote the facilities (the ones that would have been used to do B's further processing) to their alternative use.

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E8-7 (1) Average unit cost method:

Product	Units Produced	Apportionment of Joint Production Cost	Processing Cost After Split-Off	Total Production Cost
A	3,000	$ 30,000	$ 20,000	$ 50,000
B	4,000	40,000	30,000	70,000
C	3,000	30,000	50,000	80,000
Total		$100,000	$100,000	$200,000

E8-7 (Concluded)

(2) Market value method:

Product	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Apportionment of Joint Production Cost	Total Production Cost
A	$ 60,000	$ 20,000	$ 40,000	$ 16,000*	$ 36,000
B	110,000	30,000	80,000	32,000	62,000
C	180,000	50,000	130,000	52,000	102,000
Total.....	$350,000	$100,000	$250,000	$100,000	$200,000

* $100,000 ÷ $250,000 = .4; $40,000 × .4 = $16,000

E8-8

(1) Average unit cost method:

Product	Units Produced	Joint Cost Per Unit	Joint Cost
K	5,000	$1.40	$ 7,000
L	20,000	1.40	28,000
M	15,000	1.40	21,000
N	10,000	1.40	14,000
	50,000		$70,000

$$* \frac{\text{Joint Cost}}{\text{Total number of units produced}} = \frac{\$70,000}{50,000} = \$1.40 \text{ per unit}$$

(2) The weighted average method:

Product	Units Produced	×	Points	=	Weighted Units	×	Joint Cost Per Weighted Unit*	Joint Cost
K	5,000		3.0		15,000		$.50	$ 7,500
L	20,000		2.0		40,000		.50	20,000
M	15,000		4.0		60,000		.50	30,000
N	10,000		2.5		25,000		.50	12,500
					140,000			$70,000

$$* \frac{\text{Joint Cost}}{\text{Total number of weighted units}} = \frac{\$70,000}{140,000} = \$.50 \text{ per weighted unit}$$

E8-8 (Concluded)

(3) The market value method:

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Joint Cost Allocation
K	$5.50	5,000	$ 27,500	$ 1,500	$ 26,000	$18,200
L	1.60	20,000	32,000	3,000	29,000	20,300
M	1.50	15,000	22,500	2,500	20,000	14,000
N	3.00	10,000	30,000	5,000	25,000	17,500
			$112,000	$12,000	$100,000	$70,000

$$* \frac{\text{Joint Cost}}{\text{Hypothetical market value}} = \frac{\$70,000}{\$100,000} = .70 = 70\%$$

E8-9 Materials cost:

Product	Unit	×	Points	=	Weighted Units	×	Materials Cost per Weighted Unit	=	Total Materials Cost	÷	Product Units	=	Materials Cost per Product Unit
X	10,000		3		30,000		$2		$60,000		10,000		$6
Y	8,000		2		16,000		2		32,000		8,000		4
					46,000				$92,000				

Conversion cost:

Product	Unit	×	Points	=	Weighted Units	×	Conversion Cost per Weighted Unit	=	Total Conversion Cost	÷	Product Units	=	Conversion Cost per Product Unit
X	10,000		6		60,000		$1.50		$90,000		10,000		$9.00
Y	8,000		5		40,000		1.50		60,000		8,000		7.50
					100,000				$150,000				

PROBLEMS

P8-1

(1) Average unit cost method:

Product	Units (kg) Produced	Apportionment of Joint Production Cost	Processing Cost After Split-Off	Total Production Cost
B	10 000	$265,000*	$ 580,000	$ 845,000
C	10 000	265,000	720,000	985,000
Total	20 000	$530,000	$1,300,000	$1,830,000

*Joint cost of $590,000 less $60,000 by-product credit ($15 × 4 000 kg) = $530,000; $530,000 ÷ 20 000 kg = $26.50 per unit; $26.50 × 10 000 kg = $265,000.

Product	Total Production Cost per Unit	Units in Finished Goods Inventory	Finished Goods Inventory
B	$84.50	1 000 kg	$ 84,500
C	98.50	500	49,250
			$133,750

(2) Market value method:

Product	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Apportionment of Joint Production Cost	Total Production Cost
B	$1,300,000	$ 580,000	$ 720,000	$318,000	$ 898,000
C	1,200,000	720,000	480,000	212,000	932,000
Total	$2,500,000	$1,300,000	$1,200,000	$530,000*	$1,830,000

* Joint cost less by-product credit $530,000 ÷ $1,200,000 = .4417; .4417 × $720,000 = $318,024 = approximately $318,000; .4417 × $480,000 = $212,016 = approximately $212,000.

Product	Total Production Cost per Unit	Units Sold	Cost of Goods Sold
B	$89.80	9 000 kg	$ 808,200
C	93.20	9 500	885,400
			$1,693,600

P8-1 (Concluded)

(3) Neither the market value method nor average unit cost method of allocating joint cost is a more accurate way of determining joint product costs. Joint cost, because of its nature, cannot be accurately split up among joint products, since joint cost is incurred to produce one or all of the joint products. That is, joint cost cannot be reduced by dropping one of the products. Thus, to make decisions about joint production, one must look at the revenue and separable cost of each product to determine whether it is profitable on the margin. In such decisions, joint cost is not relevant. The only purpose for allocating joint costs is to determine a cost for inventories on the balance sheet and for cost of goods sold on the income statement.

For financial statement purposes, in most situations, better arguments can be made for a value-based allocation basis rather than a physically-based one. At times, the physical base can result in absurd allocations of costs among products because of the disproportionate relationship between the relative value of the joint product and the units produced, relative to other joint products.

P8-2

(1)

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Separable Processing Cost	Hypothetical Market Value*	Apportionment of Joint Production Cost[1]	Total Cost	May Sales	May Cost of Goods Sold	May Gross Profit
C	$20.00	15,000	$300,000	$ 75,000	$225,000	$ 90,000	$165,000	$260,000[2]	$143,000[3]	$117,000
L	15.00	10,000	150,000	25,000	125,000	50,000	75,000	135,000	67,500	67,500
T	9.50	20,000	190,000	40,000	150,000	60,000	100,000	95,000	50,000	45,000
Total			$640,000	$140,000	$500,000	$200,000	$340,000	$490,000	$260,500	$229,500

[1]$200,000 ÷ $500,000 = 40%
[2]13,000 × $20 = $260,000
[3]$165,000 ÷ 15,000 = $11; $11 × 13,000 = $143,000

(2)

Revenue forgone (20,000 × ($9.50 – $7))	$50,000
Cost saving (separable cost)	$40,000
Loss if offer is accepted	$10,000

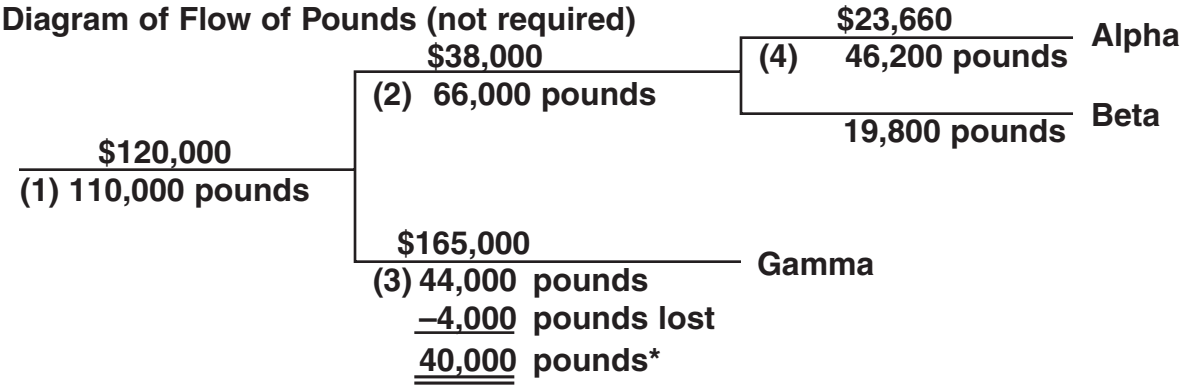
The offer should not be accepted.

P8-3

(1)

Product	Ultimate Market Value per Unit	Units Produced[1]	Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Joint Cost Allocation[3]
Alpha	$ 5	46,200	$231,000 15,660[2]	$ 38,000 23,660	$185,000	$ 44,400
Gamma.....	12	40,000	480,000	165,000	315,000	75,600
Total			$726,660	$226,660	$500,000	$120,000

[1]Diagram of Flow of Pounds (not required)



*Computation of pounds of good output of Gamma:
Let X = good output
44,000 – .1X = X
40,000 = X

[2]Market value of Beta (19,800 pounds × $1.20).....	$23,760
Less marketing expense of Beta.....	8,100
Net realizable value of Beta	$15,660

[3]The joint cost is 24% of the hypothetical market value.

P8-3 (Concluded)

(2)

SHAFFNER CORPORATION
Statement of Gross Profit for Alpha

Sales (38,400 pounds × $5)		$192,000
Production costs:		
Allocated joint cost	$102,000	
Department 2	38,000	
Department 4	23,660	
Gross cost of production	$163,660	
Less net realizable value of Beta	15,900*	
Net cost of production	$147,760	
Less ending inventory	29,552**	
Cost of goods sold		118,208
Gross profit		$ 73,792

* Net realizable value of Beta equals the revenue from Beta ($24,000) less its related marketing expense ($8,100).

** Ending inventory equals the net cost of production ($147,760) times 20%.

P8-4

(1)	Jana	Reta	Total
Sales	$250,000	$300,000	$550,000
Cost of goods sold:			
Joint cost ($236,000 – Bynd net revenue ($11,000 – $5,000 separable cost))			$230,000
Separable cost ($215,000 – $5,000 for Bynd)		210,000	210,000
Total cost			$440,000
Gross profit (20% of sales)			$110,000

(2)	Total	Jana	Reta
Ultimate sales value	$550,000	$250,000	$300,000
Less 20% gross profit	110,000	50,000	60,000
Total cost	$440,000	$200,000	$240,000
Separable cost	210,000		210,000
Joint cost allocation	$230,000	$200,000	$ 30,000

(3) Gross profit for Jana and Reta—see line 2 of requirement (2).

P8-5

(1)

Product	Ultimate Market Value per Unit	Units Produced	Ultimate Market Value	Processing Cost After Split-Off	Hypothetical Market Value	Apportionment of Joint Production Cost*
SPL-3	$4.00	700,000	$2,800,000	$ 874,000	$1,926,000	$ 960,000 **
PST-4	6.00	350,000	2,100,000	816,000	1,284,000	640,000
			$4,900,000	$1,690,000	$3,210,000	$1,600,000

* Joint production cost	$1,702,000
Less cost assigned to by-product RJ-5 (170,000 gallons × ($.70 – $.10))	102,000
	$1,600,000

**($1,926,000 ÷ $3,210,000) × $1,600,000 = $960,000

(2)

	SPL-3	PST-4	RJ-5
Joint cost allocation	$ 960,000	$ 640,000	$102,000
Additional processing cost	874,000	816,000	
Total cost	$1,834,000	$1,456,000	$102,000
Divided by gallons produced	700,000	350,000	170,000
Cost per gallon	$2.62	$4.16	$.60
Inventory costing:			
November 1 inventory (gallons)	18,000	52,000	3,000
November production	700,000	350,000	170,000
	718,000	402,000	173,000
November sales	650,000	325,000	150,000
November 30 inventory	68,000	77,000	23,000
Cost per gallon	$2.62	$4.16	$.60
Cost assigned to November 30 finished goods inventory	$ 178,160	$ 320,320	$ 13,800

(3) Per gallon sales value beyond the split-off point	$6.00
Per gallon sales value at the split-off point	3.80
Differential sales value	$2.20
Additional processing cost per gallon ($816,000 ÷ 350,000 gallons)	2.33
Per gallon gain (loss) of further processing	$(.13)

Meritt Industries should sell PST-4 at the split-off point, as the differential revenue of the sales beyond the split-off point is less than the additional cost of further processing.

Note to the instructors: The solution format for P8-6 is slightly altered from that used for process cost problem in Chapters 6 and 7. This is done to accommodate the problem's size.

P8-6 (1)

RECKLONVILLE COMPANY
Cost of Production Report—Average Method
For February

	Process 1		Process 2		Process 3	
	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost
Cost Charged to the Department						
Cost from preceding department:						
Work in process—beginning inventory			$ 6,000	$2.0000	$ 11,500	$3.8333
Transferred in during this period			21,000	2.1000	63,000	3.1500
Total			$27,000	$2.0769	$ 74,500	$3.2391
Adjusted cost from preceding department ($74,500 ÷ (23,000 units – 1,000 lost units))						$3.3864
Cost added by department:						
Work in process—beginning inventory:						
Labor and factory overhead			$ 2,000		$ 3,000	
Cost added during period:						
Materials	$58,000	$1.8125				
Labor and factory overhead	30,000	.9375	18,000	$2.0000	60,000	$3.0000
Total cost added	$88,000	$2.7500	$20,000	$2.0000	$ 63,000	$3.0000
Less value assigned to the by-product	4,000					
Total cost to be accounted for	$84,000	$2.8000	$47,000	$4.0769	$137,500	$6.3864
Cost Accounted for as Follows						
Transferred to next department or to finished goods storeroom		$84,000		$36,692		$127,727
Work in process—ending inventory:						
Cost from preceding department			$ 8,308		—	
Adjusted cost from preceding department			—		$6,773	
Labor and factory overhead			2,000	10,308	3,000	9,773
Total cost accounted for		$84,000		$47,000		$137,500

P8-6 (Continued)

Additional Computations:
Equivalent production:

	Labor and Factory Overhead	
	Process 2	Process 3
Transferred out	9,000 units	20,000 units
Ending inventory (work this period)	1,000	1,000
	10,000 units	21,000 units

Unit costs:

Materials, Process 1	$\frac{\$58,000}{32,000}$	= $1.8125 per unit
Labor and factory overhead, Process 1	$\frac{\$30,000}{32,000}$	= $ .9375 per unit
Total cost to be accounted for, Process 1	$\frac{\$84,000}{30,000}$	= $2.8000 per unit
Labor and factory overhead, Process 2	$\frac{\$2,000 + \$18,000}{10,000}$	= $2.0000 per unit
Labor and factory overhead, Process 3	$\frac{\$3,000 + \$60,000}{21,000}$	= $3.0000 per unit
Cost from preceding department, Process 2	$\frac{\$27,000}{13,000}$	= $2.0769 per unit
Cost from preceding department, Process 3	$\frac{\$74,500}{23,000}$	= $3.2391 per unit

Joint cost apportionment:

	Process 2 Product	Process 3 Product
Sales price	$10	$15
Less processing cost subsequent to split-off point	2	3
	$ 8	$12
Hypothetical market value at split-off point:		
$8 × 10,000 units transferred	$80,000	
$12 × 20,000 units transferred		$240,000
Joint cost allocation:		
$80,000 × .2625*	$21,000	
$240,000 × .2625		$ 63,000

* $84,000 ÷ ($80,000 + $240,000) = .2625

P8-6 (Continued)

Unit cost:

$21,000 ÷ 10,000 units	$2.10	
$63,000 ÷ 20,000 units		$3.15

Transferred to finished goods storeroom:

Process 2	$4.0769 × 9,000 units = $ 36,692
Process 3	$6.3864 × 20,000 units = $127,727*

*$6.3864 × 20,000 units = $127,728. To avoid a decimal discrepancy, the cost transferred to finished goods storeroom is computed as follows: $137,500 – $9,773 cost assigned to ending inventory = $127,727.

Work in process—ending inventory:

Process 2:	
Cost from preceding department	$2.0769 × 4,000 units = $8,308
Labor and factory overhead	$2.0000 × 1,000 units = $2,000
Process 3:	
Adjusted cost from preceding department	$3.3864 × 2,000 units = $6,773
Labor and factory overhead	$3.0000 × 1,000 units = $3,000

(2)	Finished goods	4,000	
	Work in Process—Process 2	21,000	
	Work in Process—Process 3	63,000	
	Work in Process—Process 1		88,000
	Finished Goods	36,692	
	Work in Process—Process 2		36,692
	Finished Goods	127,727	
	Work in Process—Process 3		127,727

P8-6 (Continued)
(3)

RECKLONVILLE COMPANY
Cost of Production Report—Fifo Method
For February,

	Process 1		Process 2		Process 3	
	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost
Cost Charged to the Department						
Work in process—beginning inventory			$ 8,000		$ 14,500	
Cost from preceding department:						
Transferred in during the month			$21,000	$ 2.10	$ 63,000	$3.15
Adjusted cost from preceding department ($63,000 ÷ (20,000 units – 1,000 lost units))						$3.32
Cost added by department:						
Materials	$58,000	$1.8125				
Labor and factory overhead	30,000	.9375	$18,000	$ 2.00	$ 60,000	$3.00
Total cost added	$88,000	$2.7500	$18,000	$ 2.00	$ 60,000	$3.00
Less value assigned to the by-product	4,000					
Total cost to be accounted for	$84,000	$2.8000	$47,000	$ 4.10	$137,500	$ 6.32
Cost Accounted for as Follows						
Transferred to next department or to finished goods storeroom—						
From beginning inventory:						
Inventory cost			$ 8,000		$14,500	
Labor and factory overhead added			4,000[1]	$12,000	6,000[5]	$ 20,500
From current production:						
Units started and finished		$84,000		24,600[2]		107,360[6]
				$36,600		$127,860
Work in process—ending inventory:						
Adjusted cost from preceding department			$ 8,400[3]		$ 6,640[7]	
Labor and factory overhead			2,000[4]	10,400	3,000[8]	9,640
Total cost accounted for		$84,000		$47,000		$137,500

[1] 2,000 × $2.00 = $4,000
[2] 6,000 × $4.10 = $24,600
[3] 4,000 × $2.10 = $8,400
[4] 1,000 × $2.00 = $2,000
[5] 2,000 × $3.00 = $6,000
[6] 17,000 units × $6.32 = $107,440. To avoid a decimal discrepancy, the cost transferred from current production is computed as follows: $137,500 – ($20,500 + $9,640) = $107,360.
[7] 2,000 × $3.32 = $6,640
[8] 1,000 × $3.00 = $3,000

P8-6 (Continued)

Additional Computations:
Equivalent production:

	Labor and Factory Overhead	
	Process 2	Process 3
Transferred out	9,000 units	20,000 units
Less beginning inventory (all units)	3,000	3,000
Started and finished this period	6,000 units	17,000 units
Add beginning inventory (work this period)	2,000	2,000
Add ending inventory (work this period)	1,000	1,000
	9,000 units	20,000 units

Unit costs:

Materials, Process 1 ..... $\frac{\$58,000}{32,000}$ = $1.8125 per unit

Labor and factory overhead, Process 1 ..... $\frac{\$30,000}{32,000}$ = $ .9375 per unit

Total cost to be accounted for, Process 1 ..... $\frac{\$84,000}{30,000}$ = $2.8000 per unit

Labor and factory overhead, Process 2 ..... $\frac{\$18,000}{9,000}$ = $2.0000 per unit

Labor and factory overhead, Process 3 ..... $\frac{\$60,000}{20,000}$ = $3.0000 per unit

Joint cost apportionment:

	Process 2 Product	Process 3 Product
Sales price	$ 10	$ 15
Less processing cost subsequent to split-off point	2	3
	$ 8	$ 12
Hypothetical market value at split-off point:		
$8 × 10,000 units transferred	$80,000	
$12 × 20,000 units transferred		$240,000
Joint cost allocation:		
$80,000 × .2625*	$21,000	
$240,000 × .2625		$63,000

* $84,000 ÷ ($80,000 + $240,000) = .2625

P8-6 (Concluded)

Unit cost:

	$21,000 ÷ 10,000 units	$2.10	
	$63,000 ÷ 20,000 units		$3.15
(4)	Finished goods	4,000	
	Work in Process—Process 2	21,000	
	Work in Process—Process 3	63,000	
	Work in Process—Process 1		88,000
	Finished Goods	36,600	
	Work in Process—Process 2		36,600
	Finished Goods	127,860	
	Work in Process—Process 3		127,860

CASES

C8-1

(1) The market value method of joint cost allocation assigns cost in proportion to each product's market value to all products as follows:

$$\frac{\text{Market Value of Each Product at Split-off}}{\text{Total Market Value of All Products at Split-off}} \times \text{Joint Production Cost}$$

If there is no market value at split-off, then the value at the first sales point, less separable cost, is used. If joint products have a market value at the split-off point, the margin for all joint products at the split-off will be the same.

The joint cost is allocated in proportion to revenue generating ability (as contrasted to some quantitative measures not related to revenue). Therefore, this accomplishes Jim Simpson's objective "that inventoriable cost should be based on each product's ability to contribute to the recovery of joint production cost."

C8-1 (Continued)

(2) (a) Because both main products have a market value at the split-off point, this value, rather than the final sales value, is used to allocate the joint cost.

Joint production cost to be allocated	$2,640,000
Net revenue value of by-product (240,000 × (.55 – .05))	120,000
Joint cost to be allocated to main products	$2,520,000

Product	Units Produced	Market Value at Split-off Per Unit	Market Value at Split-off Total	Percentage of Total Market Value
Pepco-1	900,000 gallons	$2.00	$1,800,000	62.5%
Repke-3	720,000 gallons	1.50	1,080,000	37.5
			$2,880,000	100.0%

Allocation of Joint Cost
November

Pepco-1 ($2,520,000 × .625)	$1,575,000
Repke-3 ($2,520,000 × .375)	945,000
SE-5	120,000
November joint production cost	$2,640,000

(b)	Pepco-1	Repke-3	SE-5
Allocation of joint production cost	$1,575,000	$ 945,000	$120,000
Additional processing cost after split-off	1,800,000	720,000	—
Total manufacturing cost	$3,375,000	$1,665,000	$120,000
Divide by gallons produced	900,000	720,000	240,000
Manufacturing cost per gallon.	$ 3.75	$ 2.3125	$ .50
Inventory costing:			
Inventory, November 1	20,000	40,000	10,000
November production	900,000	720,000	240,000
Inventory available	920,000	760,000	250,000
November sales	800,000	700,000	200,000
Inventory, November 30	120,000	60,000	50,000
Manufacturing cost per gallon	× $3.75	× $2.3125	× $.50
Cost of finished goods inventory	$ 450,000	$ 138,750	$ 25,000

C8-1 (Concluded)

(3) When SE-5 becomes a main product, the joint production cost would be allocated proportionally to all three products on the basis of the market value of each product at the split-off point. The net revenue of SE-5 will no longer be deducted from the joint production cost prior to allocation because SE-5 will no longer be a by-product.

C8-2

There are a number of areas that appear to be problematic in Harvard Products' costing and decision-making processes. These areas, which are outlined below, need to be reviewed and perhaps modified.

(1) The use of the average unit cost method for allocating joint product cost. Units produced, although a simple method of allocation, is not necessarily the best method for apportioning cost across joint products. This method can distort the cost-value relationship of a joint product and give an especially misleading picture of the gross margin provided by a joint product. For example, assume that in meat processing of cattle, one produced ground beef and steaks. Each pound of ground beef would be assigned the same joint cost as each pound of steak, yet the sales prices per pound are quite different. For this reason, it is better to use some value-related allocation base, such as the market or sales value method, to allocate cost.

(2) Inclusion of all spoilage costs in product cost. Spoilage in production processes can be assessed as normal or abnormal. Whether spoilage is normal (expected) or abnormal (unexpected) should guide the way in which spoilage costs are handled in product costing. Normal spoilage is part of product cost since it is planned for in implementating the production technology. Abnormal spoilage should be written off as a loss in the period, and if the amount is material or the spoilage continues for a long time, the source of spoilage should be found and corrected. The company does not seem to be distinguishing clearly between normal and abnormal spoilage. This needs to be studied, and some changes need to be made in the application of spoilage costs to product.

(3) Decision making based on fully allocated cost. The company appears to be about to make a product line decision on fully allocated cost data with joint cost included. Decisions with relation to any of the products should be based on the separable contribution margin of products, i.e., separable revenue less separable variable cost. This problem needs to be looked at closely since the allocated joint cost figures should be used only for financial statement purposes.

C8-3

(1) The market value method does not provide additional data for the marketing decision. Joint cost allocation is necessarily arbitrary and, although used for financial accounting purposes, is not relevant to the decision to market DMZ-3 and Pestrol. The VDB joint cost is irrelevant to this decision because it is incurred in both cases, i.e., the method of cost allocation has no impact on the differential profit. The company should calculate the differential profit of its alternate choices by comparing the differential revenues and differential costs.

(2) The company's analysis is incorrect because it incorporates allocated portions of the joint cost of VDB. The weekly cost of VDB ($246,000) will be incurred whether or not RNA-2 is converted through further processing. Thus, any allocation of the joint cost of VDB is strictly arbitrary and not relevant to the decision to market DMZ-3 and Pestrol. The company's decision not to process RNA-2 further is incorrect. The decision results in a loss of $20,000 in profit per week, as indicated by the following analysis:

Revenue from further processing of RNA-2:

DMZ-3 (400,000 × ($57.50 ÷ 100))	$230,000
Pestrol (400,000 × ($57.50 ÷ 100))	230,000
Total revenue from further processing	$460,000
Less revenue from sale of RNA-2	320,000
Differential revenue	$140,000
Differential cost*	120,000
Differential profit	$ 20,000

*** The cost of VDB is not relevant and, thus, is omitted from the solution.**

C8-4

(1) (The requirement does not ask for a list of responsibilities Vickery has violated, but, merely, which of the fifteen responsibilities apply to Vickery's situation.)

Management accountants have a responsibility to:

Competence: Perform their professional duties in accordance with relevant laws, regulations, and technical standards. (The inventory cost Vickery is being asked to accept violates accounting principles of conservatism and of matching current cost against current revenue.)

Prepare complete and clear reports and recommendations after appropriate analyses of relevant and reliable information. (Vickery has convincing evidence that failure to make the adjustment will misstate the resulting financial statements.)

Integrity: Refrain from either actively or passively subverting the attainment of the organization's legitimate and ethical objectives. (There is pressure to subvert legitimate and ethical objectives to the immediate need for favorable financial statements.)

Communicate unfavorable, as well as favorable, information and professional judgments or opinions. (Vickery is being asked to thwart communication of unfavorable information.)

Refrain from engaging in or supporting any activity that would discredit the profession. (Preparing deliberately misleading financial statements clearly is a discredit to the profession.)

Objectivity: Communicate information fairly and objectively. (Vickery would violate this responsibility if the inventory were not restated.)

Disclose fully all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, comments, and recommendations presented. (This material overstatement of inventory and profit violates this ethical responsibility.)

(2) In addition to his ethical responsibilities to his company, Vickery has ethical responsibilities to:

(a) the bank
(b) the company's stockholders
(c) the management accounting profession